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AUTHOR King, Irvin L.
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ABSTRACT

Because of their geographical isolation from major population centers, many of the islands of Micronesia are without live television or daily newspapers. However, the skies of the Pacific are alive with radio broadcasts that can be received with shortwave radios. This presentation explains the nature of shortwave radio and describes how teachers can use it to motivate learning and integrate a variety of topics into the school curriculum. By tape recording international shortwave programs and making reception reports, teachers can motivate students to learn about the outside world. This requires a dedicated teacher who is willing to make the extra effort; but, with such a teacher, students in the Pacific can travel around the world on the wings of shortwave radio. Appendix A presents a sample reception report. Appendix B lists some possible broadcasts. Appendix C lists Universal Coordinated Times or Greenwich Mean Times and local times for each component of Micronesia.

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Shortwave Radio: A Tool for Integrating the Curriculum

Irvin L. King

Division of Field Services

College of Education

University of Hawaii

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Abstract

Because of their geographical isolation from major population centers, many of the islands of Micronesia are without live television or daily newspapers. However, the skies of the Pacific are alive with radio broadcasts which can be received with shortwave radios. This presentation explains the nature of shortwave radio and describes how teachers can use it to motivate learning and integrate a variety of topics into the school curriculum.

Shortwave Radio: A Tool for Integrating the Curriculum

The islands of Micronesia are scattered over a vast expanse of the Pacific Ocean equal in size to the mainland United States. Being geographically isolated from major population centers, most islands are still without live television and daily newspapers. However, Micronesia is not without daily links to the outside world, for the skies in the Pacific are a vast reservoir of international news and entertainment programs which can be received by shortwave radio. Today I shall explain how shortwave radio can be used to motivate learning and integrate a great variety of activities in the school curriculum.

Discovering Shortwave Radio

I first traveled to Micronesia during the summer of 1976 when I spent seven weeks conducting metric education workshops for teachers in Micronesia. My travels that summer took me first to Saipan, then to Palau, Yap, Chuuk (formerly called Truk), Pohnpei (formerly called Ponape), and the Marshall Islands. Saipan was a fairly modern community, and I felt very much at home there. However, life in the rest of Micronesia at that time was much different from my existence in Honolulu. Water was often in short supply, power was frequently off, most of the roads were unpaved, and there were no fresh foods in the stores. I took all of this in stride; such things were but of minor inconvenience to me, and they served to remind me that we in Hawaii were indeed fortunate to have reliable supplies of such commodities.

However, by the time I arrived on Yap I was starved! Not for food, but for news of the world. In Hawaii I had grown accustomed to having radio broadcasts 24 hours a day with news at the top of every hour, television news report every evening, and a daily newspaper to read. None of these were available in Micronesia, and I missed them very much. So much, in fact, that I found myself approaching other travelers who were complete strangers in bars or restaurants to ask them about the latest news from the outside

world. It was at the open-air, thatched-roofed bar at the Cliff Rainbow Hotel in Pohnpei that my starvation came to an end. Sitting at the table next to me was Hitchcock, an inspector of some sort, who was sipping a cold one in the afternoon heat. When I asked him for the latest news, he generously offered to let me use his shortwave radio. Until then I had no idea of what shortwave radio was, and as I scanned the dial, listening for English-speaking broadcasts, I was amazed at the wide assortment of programming available to me: The Voice of America, Radio Moscow, the British Broadcasting Corporation, Radio Australia, Radio Beijing, The Voice of the Andes, and many, many more. The first thing I did upon returning to Honolulu was to purchase my first shortwave radio. Now, I never travel without it.

What is shortwave radio? Shortwave is just another type of radio broadcast, like the mediumwave AM and FM bands with which most people are familiar. However, there are a number of differences between AM/FM and shortwave radio: (1) most AM and FM stations are owned and operated by private companies, but the vast majority of shortwave stations are owned and operated by government agencies; (2) AM and FM stations use local times, but shortwave radios stations use Universal Coordinated Time (UTC), which is also known as Greenwich Mean Time; (3) AM and FM radio each use a single band of frequencies while shortwave radio uses 13 bands, (4) regular AM and FM broadcasts are intended for audiences within a few hundred miles of the station, but shortwave broadcasts are aimed at audiences around the world; and (5) most AM and FM stations broadcast 24 hours a day on the same channel (or frequency), but shortwave stations broadcast on different frequencies and the programs may last for less than an hour;

How is it possible to broadcast radio programs around the world? Up in the sky, from 60 to 200 miles above the earth, there are several layers of air of different thicknesses called the ionosphere. When radio waves are transmitted into the sky, they actually bounce

off the ionosphere and are deflected back towards the earth. The broadcaster aims the radio waves into the sky at the precise angle so that the waves will be deflected to an audience on the other side of the earth. Because there are 1100 channels available for shortwave broadcasting, and because 150 countries broadcast over them, the skies are literally alive with interesting radio programs. I should mention that television waves do not bounce off the ionosphere - they continue into space. In order to deflect television waves back to earth, satellites have been placed in stationary orbit around the earth.

Unfortunately, the ionosphere is constantly changing in its ability to reflect radio waves. This is because the ionosphere is affected by the electrical energy of the sun. When the energy from the sun reaches these layers of air, it electrifies them, and since radio waves are electromagnetic in nature, they are affected by the electrical content of the ionosphere. Thus, the ability of a given layer of the ionosphere to reflect radio waves varies from hour to hour, from day to day, and from month to month. To further complicate the matter, different frequencies react differently with different layers of the ionosphere. Such difficulties force broadcasters to change the times and frequencies of their broadcasts.

Reception Reports

Because of the electrical interference from the sun, the broadcasts are not always clear and easy to hear or understand. In order to know how well their broadcasts are being received in various parts of the world, most shortwave stations invite listeners to send in reception reports describing how clearly the station was received. A copy of a reception report appears in Appendix A. To complete a report, the listener must cite the time and date of the broadcast in Coordinated Universal Time, describe the content of a few minutes of the broadcast, and rate the quality of the broadcast using a SINPO rating. SINPO stands for the Strength of the signal, the amount of Interference from other stations, the amount of

Noise caused by atmospheric phenomena such as lightning, the Propagation (the steadiness or fading) of the signal, and the Overall quality of the broadcast. Each is rated on a five-point scale; a SINPO rating of 5555 is a perfectly clear broadcast, a rating of 11111 is unreadable.

When a station receives a valid reception report, it sends the listener verification in the form of a QSL card. QSL is a term from radio telegraphy which means "received." Most stations also send other information such as broadcast schedules, blank reception reports, small gifts, and newsletters. For example, this past year Radio Beijing sent me bumper stickers, iron-on decals, a newsletter, and and a set of ten questions about China with which I could enter a contest in celebration of Radio Beijing's 45th year of broadcasting. By listening to a special program on Chinese history and culture, listeners could learn the answers to the ten questions about China, and at the end of the month those persons who mailed in the correct answers were eligible for a prize.

Shortwave Radio in the Classroom

Given the geographical isolation of the regions of Micronesia, given the fact that shortwave radio is ubiquitous in the Pacific, and given the willingness of foreign broadcasters to correspond to their listeners, shortwave radio listening can be used as a powerful tool in integrating a great variety of learning into the school curriculum. Imagine an entire class of students working together to answer the questions on the Radio Beijing quiz in order to enter the contest. Imagine also the excitement when the class receives a reception report from a foreign country.

The strategy is a simple one. All that is needed is a shortwave radio, a tape recorder, and a dedicated teacher. The teacher records a shortwave broadcast and plays the tape to the students, then the class sends in a reception report. The goal is to collect as many QSL cards as possible. In the process, encouraged by the excitement of

corresponding with a foreign country, the teacher leads the students through a variety of related learning activities.

Passport to World Band Radio (Magne, 1991) is an excellent book for anyone interested in shortwave radio. It provides a consumer report on the best radios to purchase and gives a complete listing of the times, frequencies, and target areas of all international broadcasts. Since the book may not be readily available to many readers, I have provided some handouts for teachers interested in trying this approach (see appendices). Suitable radios can be purchased for less than \$200. Any shortwave radio with a recording jack will suffice, although it is worth a little extra to purchase a radio with digital readouts because it is much easier to determine the exact frequency you have dialed. Likewise, any tape recorder with a recording jack will do. To record a broadcast, the radio and tape recorder should be connected with a dubbing cord, and when a program is dialed on the radio, the tape recorder should be placed in the record mode. Appendix B contains a list of shortwave broadcasts which are readily received in the Pacific region. With patience, you should have no difficulty finding these broadcasts. For the most part, teachers should try to record broadcasts during the evening hours since reception is usually better at that time. However, some very clear broadcasts can be received during daylight hours, and students could try to tune in the broadcasts during class time.

Introducing the Activity to the Class

There is no one way to do it, but the following procedures have been used by some teachers to introduce the activity. Record a clear broadcast before mentioning the idea to the class. Then introduce shortwave radio to your students by sharing the contents of this presentation with them. Before playing the tape for the class, provide the students with an advance organizer by summarizing some of the main things they will hear on the tape. Since English is their second language, they might need some help in hearing and

understanding the content of the broadcast. Then play the tape for the students as they listen carefully and take notes on what they hear. When it is finished, have the class make out a reception report on the chalkboard as a group activity. You may want to replay the tape to verify the content and your SINPO rating. Tell the class you are going to mail the report, and challenge them to obtain as many QSL cards as possible. Mail it at the post office, making sure that there is enough postage. Allow four or five weeks for a reply.

For extra motivation, place a map of the world on the wall or bulletin board and have the students stick a tack or colored pin on each country whose broadcast they have received. The idea is to get as many pins on the map as possible. After the teacher has completed several reception reports, small groups of students can be assigned the task of listening to the tape and writing the reception report.

Ideas for Integrating the Curriculum

The challenge of obtaining QSL cards from as many countries as possible serves as the motivating factor in this approach. However, the goal of the activity is to learn something about the world and other countries. The following paragraphs provide a few ideas on how the theme of shortwave radio listening can be used to integrate a variety of subjects into the school curriculum. The activities which follow are appropriate for students in grades four through twelve.

English is an obvious subject whose skills can be taught by this activity. By listening to radio broadcasts and helping to write reception reports, students develop their listening, comprehension, and writing skills. If each reception report is submitted with a letter from the class, additional thinking and writing skills can be developed. Once they are familiar with the procedure, students can be organized into groups, and the groups can take turns listening to the tapes and preparing a reception report. Before mailing the report, each group should summarize the content of the broadcast for the rest of the class.

Geography is another natural subject which can be learned through shortwave radio. The teacher should have a large world map displayed on the wall, and a tack or pin should be placed on each country whose broadcasts are received. Students can be required to memorize the location of each country, to spell it, and to name its capital city. Teachers who have access to a MACINTOSH computer should make an effort to obtain a copy of MacGlobe, a software package which has information about every nation on earth, including maps of every nation, population figures, distances between nations, the flags, and even the national anthems.

Many kinds of programs on shortwave radio are useful for the study of Social Studies, including news broadcasts, shows which feature native music or cooking, cultural or historical information about the country, and letters from listeners. News reports, given on the hour, can be the springboard for a wide range of discussions on current events and will illustrate how one nation might view world events differently than another nation. The correspondence received from each country can also be a rich source of ideas. As mentioned above, Radio Beijing held a contest this past year to see if listeners could answer ten questions about China. The entire class could participate in such activities. By reading the Radio Beijing Newsletter, students might also learn about such diverse topics as minority groups in China or the Great Wall of China.

Mathematics can also be integrated into the activity. For example, students can convert local to UTC. Appendix C is provided to help you and the students convert your time to UTC in making reception reports. Students might also determine the distance from their island to the country making the broadcast, find the longitude and latitude of both the country and their island, discover that the earth's circumference is comprised of 360 degrees and that each of 24 time zones contains about 15 degrees, and look up the meaning of kHz and learn the other common metric prefixes.

The study of radio itself can be a useful Science lesson. Students can first learn how to operate a shortwave radio. Radio waves are "electromagnetic" waves made up of both electricity and magnetism. By hooking up a dry cell battery to a coil of wire, students can perform their own experiment to produce electromagnetic waves. Students might also be assigned the task of researching information on such topics as the ionosphere, the effect of sun spots and solar flares upon radio transmission, and the life and accomplishments of Gustav Hertz, an early pioneer in the development of radio.

High school students who are enrolled in a Foreign Language course can apply their knowledge by listening to a broadcast in that language. It will probably be necessary for the students to listen to the tape of the broadcast several times, stopping frequently, in order to translate the broadcast. Making a reception report in the foreign language would also be a challenging cooperative learning activity for the entire class.

Summary

In my presentation today, I have shown how shortwave radio can be used to integrate a variety of subjects into the curriculum. By tape recording international shortwave programs and making reception reports, teachers can motivate students to learn about the outside world. The basic approach requires a shortwave radio and a tape recorder. But more importantly, it requires a dedicated teacher who is willing to embark on the journey. In the hands of a resourceful teacher, students in the Pacific can travel around the world on the wings of shortwave radio broadcasts.

References

- Magne, L. (Ed.) (1991). Passport to World Band Radio. International Broadcasting Services, Ltd. Penn's Park, PA.
- MacGlobe (1991) [Computer program]. P.C. Globe, Inc. Tempe, Arizona.

Appendix A **Sample Reception Report**

Station _____	Language _____
Date _____	Time _____ UTC
Frequency _____ kHz	SINPO _ _ _ _ _
Type of Radio _____	
Program Details: _____	

Comments and suggestions: _____

Listener's name and address: _____

Guidelines for the SINPO Rating

	S	I	N	P	O
5	excellent	none	no noise	no fading	excellent
4	good	slight	slight	slight	good
3	fair	moderate	moderate	moderate	fair
2	poor	severe	severe	severe	poor
1	very weak	extreme	extreme	extreme	unusable

Appendix B
Best Bets for Shortwave Reception in Micronesia

Radio Station	UTC	Frequency in kHz
Radio Australia P.O. Box 755 Glen Waverley VIC 3150 Australia	All hours. Try these frequencies. 17795, 21740	5995, 6060, 6080, 7240, 9580 9710, 11720, 11800, 11910 11930, 13605, 13705, 15240 15320, 15365, 15465, 17715
Radio Beijing English Department Beijing 100866 China	1200-1400	11600
Voice of Free China P.O. Box 24-38 Taipei, Taiwan Republic of China	0200-0400*	9765, 15345
HCJB, Voice of the Andes Casilla 17-01-00691 Quito, Ecuador	0030-0430 0700-1130 1900-2200	21455, 25950 21455, 25950, 11925 21480, 25950
Radio Japan/NHK Tokyo 150-01 Japan 2100-2200	0500-0600 1700-1800 1900-1930 11815, 17890	15195 9505, 11865 9640, 11850, 11865, 15270
Radio New Zealand Broadcast House P.O. Box 2092 Wellington, New Zealand	0630-1110 1700-2110 2105-0630	9700 13785 17770
Radio Norway International 0340 Oslo 3, Norway 2200-2230	1200-1230 1900-1930 21705	25730 15220, 17730
Radio Moscow Ulitsa Pyatnitskaya 25 113326 Moscow, Russia	0000-0800 1300-0800 2030-0800	15195 12050 9635
BBC World Service P.O. Box 76 Bush House, Strand London WC2B 4PH United Kingdom	0000-0030 0145 0600, 0700 1800, 1900, 2000-2200	11955 5965, 7135, 9580, 11955 7150, 9640, 11955, 17830 11750 11750, 15340
Christian Science Monitor P.O. Box 860 Boston Massachusetts 02123	All hours. Try these frequencies.	9475, 11580, 13625, 13760 15405, 15610, 17780, 17865
Voice of America 330 Independence Ave., SW Washington D.C. 20547	1900-2000 2100-0100 2200-2400	9525, 11870 11870, 17735 15305

Appendix C

UTC and Local Times for Micronesia

GMT or UTC	MARSHALL ISLANDS	KOSRAE POHNPEI	CHUUK CNMI GUAM YAP	PALAU
0000	1200 (Noon)	1100 (11 am)	1000 (10 am)	0900 (9 pm)
0100	1300 (1 pm)	1200 (Noon)	1100 (11 am)	1000 (10 pm)
0200	1400 (2 pm)	1300 (1 pm)	1200 (Noon)	1100 (11 pm)
0300	1500 (3 pm)	1400 (2 pm)	1300 (1 pm)	1200 (Noon)
0400	1600 (4 pm)	1500 (3 pm)	1400 (2 pm)	1300 (1 pm)
0500	1700 (5 pm)	1600 (4 pm)	1500 (3 pm)	1400 (2 pm)
0600	1800 (6 pm)	1700 (5 pm)	1600 (4 pm)	1500 (3 pm)
0700	1900 (7 pm)	1800 (6 pm)	1700 (5 pm)	1600 (4 pm)
0800	2000 (8 pm)	1900 (7 pm)	1800 (6 pm)	1700 (5 pm)
0900	2100 (9 pm)	2000 (8 pm)	1900 (7 pm)	1800 (6 pm)
1000	2200 (10 pm)	2100 (9 pm)	2000 (8 pm)	1900 (7 pm)
1100	2300 (11 pm)	2200 (10 pm)	2100 (9 pm)	2000 (8 pm)
1200	0000 (12 am)	2300 (11 pm)	2200 (10 pm)	2100 (9 pm)
1300	0100 (1 am)	0000 (12 am)	2300 (11 pm)	2200 (10 pm)
1400	0200 (2 am)	0100 (1 am)	0000 (12 am)	2300 (11 pm)
1500	0300 (3 am)	0200 (2 am)	0100 (1 am)	0000 (12 am)
1600	0400 (4 am)	0300 (3 am)	0200 (2 am)	0100 (1 am)
1700	0500 (5 am)	0400 (4 am)	0300 (3 am)	0200 (2 am)
1800	0600 (6 am)	0500 (5 am)	0400 (4 am)	0300 (3 am)
1900	0700 (7 am)	0600 (6 am)	0500 (5 am)	0400 (4 am)
2000	0800 (8 am)	0700 (7 am)	0600 (6 am)	0500 (5 am)
2100	0900 (9 am)	0800 (8 am)	0700 (7 am)	0600 (6 am)
2200	1000 (10 am)	0900 (9 am)	0800 (8 am)	0700 (7 am)
2300	1100 (11 am)	1000 (10 am)	0900 (9 am)	0800 (8 am)

Notes:

- 1) The 24 hour clock is used with times given in 4-digits, the first two digits tell the hour and the last two the minutes. 0546 is 5:46 am and 1746 is 5:46 pm.
- 2) Times above 0000 in the chart are for the previous day to UTC. For example, if it is 5 pm Tuesday (or 1700 UTC) in Palau, find 1700 under Palau and move left to the UTC column to see that it is 0800 Wednesday UTC.
- 3) Times below 0000 in the chart are the same day.